



# Loan Loss Provisions and Lending Behavior of Banks: Do Information Sharing and Borrower Legal Rights Matter?

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**Loan loss provisions and bank lending behavior:  
Do information sharing and borrowers' legal rights matter?**

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**Abstract**

We examine the roles of information sharing and borrower's legal rights in affecting the procyclical effect of bank loan loss provisions. Based on a sample of Asian banks, our empirical results highlight that higher non-discretionary provisions reduce loan growth and, hence, non-discretionary provisions are procyclical. A closer investigation suggests that better information sharing through public credit registries managed by central banks, not private credit bureaus managed by the private sector, might substitute for the role of dynamic provisioning systems in mitigating the procyclicality of non-discretionary provisions. We also document that higher discretionary provisions in countries with stronger legal rights for borrowers temper the procyclical effect of non-discretionary provisions. However, these findings hold only for small banks. This suggests that the implementation of dynamic provisioning systems to mitigate the procyclicality of non-discretionary provisions is more crucial for large banks.

**Keywords:** Loan loss provisions, Loan growth, Information sharing, Borrower's legal rights

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**1. Introduction**

During the last three decades, financial crises in both developed and developing countries were mostly preceded by strong macroeconomic performance in an environment with poor bank risk management (e.g., the 1980 US savings and loan crisis, the 1994/1995 Mexican crisis, the 1997/1998 Asian crisis, the 1998 Russian crisis, and the 2008 credit crisis that led to a prolonged global economic downturn). Such developments suggest an increasing need for sound credit risk management in banking to limit the riskiness of banks and prevent a procyclical effect during economic downturns. Indeed, overcoming the procyclicality of bank credit risk management—particularly that related to bank capital regulation—has become one of the key issues in the new Basel Accords. The procyclical effect of credit risk management mainly occurs because banks tend to underestimate credit risk during cyclical upturns and overestimate it during cyclical downturns (Altman, 2005). Consequently, these actions reduce loan availability and deepen economic recessions.

Prior studies of banks' procyclical behavior have been conducted through two major research avenues. The first strand of the literature focuses on the impact of macroeconomic fluctuations on bank capital buffers to examine whether capital buffers are procyclical over the business cycle. In this regard, banks are required to fulfill minimum capital adequacy ratios in order to cope with credit risk. Since capital requirements are based on risk, banks tend to increase capital buffers and reduce loans during a cyclical downturn when impaired loans

materialize. The second strand of the literature explores the effect of macroeconomic fluctuations on loan loss provisions and how provisioning affects bank lending behavior.

In spite of the growing literature focusing on the first strand (e.g., Ayuso et al., 2004; Borio et al., 2001; Estrella, 2004; Jokipii and Milne, 2008), very limited attention has been given to the second strand of research, particularly to the link between loan loss provisions and bank lending. Several studies highlight the presence of the procyclicality of loan loss provisions over the business cycle (e.g., Laeven and Majnoni, 2003; Bikker and Metzmakers, 2005; Craig et al., 2006); however, only Bouvatier and Lepetit (2008) and Bouvatier and Lepetit (2012) assess how provisioning affects bank lending. Bouvatier and Lepetit (2008) focus on European banks, while Bouvatier and Lepetit (2012) extend their previous study by incorporating a sample of banks from emerging markets. By partitioning loan loss provisions into those that are discretionary and non-discretionary, Bouvatier and Lepetit (2008) document that non-discretionary loan loss provisions exacerbate a procyclical effect because higher non-discretionary provisions reduce bank loan growth. In contrast, discretionary loan loss provisions, particularly those related to income-smoothing behavior, have no significant impact on bank loan growth. In this sense, the adoption of a dynamic provisioning system is desirable because it allows banks to generate higher statistical provisions to complement discretionary provisions, which cannot directly offset the procyclical effect of non-discretionary loan loss provisions. Moreover, Bouvatier and Lepetit (2012) further document that the procyclicality of non-discretionary loan loss provisions in banking is more pronounced in emerging markets.

In parallel, another strand of the literature advocates for greater information sharing activities to strengthen financial intermediation. Greater lending activities and lower credit risk can be observed in countries in which public and private credit bureaus are higher quality

(Jappelli and Pagano, 2002). Love and Mylenko (2003) highlight the role of private credit bureaus and public credit registries in reducing firms' financing constraints. Specifically, private credit bureaus have a greater effect on alleviating firms' financing constraints than public credit registries. Brown et al. (2009) also document that greater information sharing increases bank lending through a reduction in intermediation cost. Houston et al. (2010) further find that stronger legal rights for creditors are associated with higher economic growth. Against this backdrop, our contribution is twofold.

First, given that better information sharing and stronger legal rights might strengthen financial intermediation, we explore whether information sharing and strengthened legal rights for borrowers can mitigate the procyclicality of bank loan loss provisions. Hence, we highlight whether better credit information sharing and increased borrowers' legal rights can substitute for the adoption of a dynamic provisioning system. To the best of our knowledge, we are the first study to examine this issue. Second, we specifically assess whether the procyclicality of loan loss provisions—as well as the role of information sharing and legal rights in affecting such procyclicality—differs between large and small banks. Bank size is an important dimension in bank credit risk management because large banks are sometimes prone to be “too big to fail” and have moral hazard problems (Mishkin, 2006; Kane, 2000). During economic boom periods, large banks can arguably generate lower loan loss provisions to anticipate unexpected credit risk because they believe that the government can rescue them in case of failure. As such, the role of bank size in the procyclicality of loan loss provisions warrants further examination.

To examine these issues, we focus on emerging markets in Asia for at least three reasons. First, bank credit is the predominant source of financing for private sector businesses in Asian countries, and therefore, unsound credit risk management in banking can exacerbate financial

disintermediation during a cyclical downturn (Adams, 2008; Angkomkiew et al., 2009). Second, conflicts of interest between bank regulators and investors are apparent in Asian banks when banks rely on loan loss reserves to cope with credit risks. Agusman et al. (2009) document that higher loan loss reserves reduce bank stock returns. In other words, bank regulations related to loan loss reserves and provisioning are subject to conflicts of interest between investors and bank regulators, at least in the Asian context. Hence, assessing the issue of loan loss provisions in Asian banks is relevant to examining how bank regulations and investors' interests might be harmonized, particularly through the adoption of a dynamic provisioning system that increases loan loss provisions during economic boom periods. Third, loan loss provisioning systems vary across Asian countries. Although the procyclicality of loan loss provisions became a major issue after the 1997 crisis, the implementation of dynamic provisioning systems is still limited in Asian countries.<sup>1</sup>

The rest of this paper is structured as follows. Section 2 reviews the existing literature on the use of loan loss provisions for bank credit risk management and its implications. Section 3 describes our data and research method. Section 4 discusses our empirical results and presents our robustness checks; and Section 5 concludes the paper.

## **2. Related review of literature and research focus**

Banks use loan loss provisions as a prudential device to manage credit risk. However, loan loss provisions can be procyclical with the business cycle because loans are more likely to default during a cyclical downturn. This, in turn, increases banks' risk aversion, boosting loan

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<sup>1</sup> See Angkomkiew et al. (2009) for further discussion of the existing loan loss provisioning systems in various Asian countries responding to the 1997/1998 financial crisis.

loss provisions (Altman, 2005). From an accounting perspective, there are two types of provisions for bank credit risk: specific and general (Cortavaria et al., 2000). While specific provisions address identified, impaired loans through an increase in loan loss reserves, general provisions are associated with a broad assessment of possible future losses in the entire bank portfolio. As banks need to estimate general provisions, such provisions can be influenced by subjective judgments related to managers' discretionary behavior.

The literature documents that general provisions can be further partitioned into non-discretionary and discretionary components. Non-discretionary provisions cover expected credit risks and are considered backward-looking (Whalen, 1994; Beaver and Engel, 1996). Discretionary provisions are used for managerial objectives and are considered forward-looking. Specifically, the discretionary component is linked to three discretionary actions: capital management, income smoothing, and signaling (Ahmed et al., 1999; Lobo and Yang, 2001; Kanagaretnam et al., 2003, 2004 & 2005; Anandarajan et al., 2007; Hasan and Wall, 2004).

The Basel Accord definition of capital emphasizes that part of general provisions counts as capital. When loan losses are excessive during a cyclical downturn, increases in specific provisions can be inadequate to cover expected loan losses. Such loan losses can erode bank capital and can, in turn, adversely affect banks' incentives to grant new loans, exacerbating a cyclical downturn. This situation is often referred to as a "capital crunch" and has been documented in the literature related to bank capital requirements (e.g., Bernanke and Lown, 1991; Peek and Rosengren, 1995).

Prior studies have documented that the bank provisioning system is procyclical in general. Laeven and Majnoni (2003) point out that the procyclicality of loan loss provisions can be shown by the negative impact on loan loss provisions of higher loan growth, economic growth, or



earnings. In a cross-country setting, Cavallo and Majnoni (2002) also find a negative link between economic growth and loan loss provisions. Bikker and Metzmakers (2005) document similar evidence for Organization for Economic Co-operation and Development (OECD) countries. In a single country setting, Arpa et al. (2001) document the procyclicality of bank loan loss provisions over the business cycle in Austria, while Fernandez de Lis et al. (2001) and Pain (2003) document similar results for Spanish and UK banks, respectively. Packer and Zhu (2012), Angklomkliew et al. (2009) and Craig et al. (2006) focus on Asian banks and, again, report identical results. Nevertheless, to the best of our knowledge, no prior research examines how loan loss provisions affect bank-lending behavior in the Asian context.

Another strand of the literature advocates for the inclusion of a sound provisioning system in any regulations on bank capital requirements (Cavallo and Majnoni, 2002; Banque de France, 2001). This is because a sound provisioning system can avoid credit risk miscalculation due to disaster myopia in a cyclical downturn (Guttentag and Herring, 1984), herd behavior (Rajan, 1994), or institutional memory hypothesis (Berger and Udell, 2003). Fernandez de Lis et al. (2001) propose a dynamic or statistical provisioning system to solve procyclicality issues for Spanish banks. Statistical provisions are not intended to substitute for specific provisions, but instead to complement the loan loss provisioning system. Specific and general provisions are estimated in line with traditional procedures, while statistical provisions are calculated from the difference between expected loan losses and specific provisions (Bouvatier and Lepetit, 2008).

Because statistical provisions are estimated to anticipate risks due to business cycle fluctuations, they tend to increase during a cyclical upturn in anticipation of a future cyclical downturn. As a consequence, the funds obtained from “reserves” generated by the statistical provisions in the earlier period of an economic boom can smooth bank profits and losses.

Consequently, incorporating statistical provisions into a bank provisioning system can mitigate banks' incentives to grant new loans when expected credit risks are underestimated, particularly during a cyclical upturn. As long as banks can improve credit risk evaluation and profit management in their provisioning systems, Borio et al. (2001), Mann and Michael (2002), and Jiménez and Saurina (2005) support Fernandez de Lis et al.'s (2001) contention that the procyclicality of bank loan provisions can be resolved.

In order to assess the importance of implementing a dynamic provisioning system for European countries such as Spain, Bouvatier and Lepetit (2008) examine the impact of non-discretionary and discretionary provisions on bank loan growth in several stages. In the first stage, they examine the determinants of bank loan loss provisions (LLP). In doing so, they create a LLP model in which loan loss provisions are regressed on backward-looking indicators related to problem loans (e.g., non-performing loans, loan-to-asset ratio, and annual GDP growth) and forward-looking indicators depicting the capital management, income smoothing, and signaling activities of banks. In the second stage, bank loan loss provisions are subsequently grouped into discretionary and non-discretionary components. The discretionary component is computed as the fitted values of the LLP model in which forward-looking indicators become explanatory variables. In parallel, the non-discretionary component is computed as the fitted values of the LLP model in which backward-looking indicators become explanatory variables. In the third stage, they create a regression model to examine the impact of estimated discretionary and non-discretionary provisions on bank loan growth. They show that non-discretionary provisions negatively affect bank loan growth, while discretionary provisions have no statistically significant impact on bank loan growth. Hence, only non-discretionary provisions exacerbate the procyclical effect of loan loss provisions over the business cycle.

Building on their previous study, Bouvatier and Lepetit (2012) modify their procedure to estimate non-discretionary provisions by incorporating an indicator of income smoothing. They argue that loan loss provisions might be used to smooth income as part of bank discretionary behavior, and this behavior might be important for offsetting the negative impact of non-discretionary provisions on bank loan growth. Their empirical results reveal that greater income smoothing tempers the negative impact of non-discretionary provisions on bank loan growth, but the negative impact remains apparent. In this regard, the use of a statistical or dynamic provisioning system is desirable because greater income smoothing is not sufficient to mitigate the procyclicality of non-discretionary provisions.

Despite the importance of a dynamic provisioning system, a bank's characteristics (such as bank size) might determine its capacity to implement one. Similarly, each country has a different macroeconomic and institutional environment that can substantially vary its capacity to adopt a dynamic provisioning system. For such reasons, we extend prior research on the link between loan loss provisions and bank lending behavior by considering bank size to account for bank-specific characteristics and information sharing and legal rights to account for country-specific factors. Information sharing and legal rights are relevant because financial intermediation is conditioned by the extent to which information systems and legal rights are of better quality (e.g., Jappelli and Pagano, 2002; Love and Mylenko, 2003; Brown et al., 2009; Houston et al., 2010).

With regards to the influence of legal rights on the link between loan loss provisions and bank loan growth, we consider the influence of the legal rights of borrowers instead of creditor legal rights as in Houston et al. (2010) because we examine the impact of loan loss provisions on bank loan growth from the demand side. Arguably, stronger legal rights for borrowers can

increase borrowers' confidence in the banking sector. This in turn can reduce the procyclical effect of loan loss provisions on bank loan growth, particularly during economic downturns.

Although we divide loan loss provisions into discretionary and non-discretionary components, our method differs from Bouvatier and Lepetit (2008, 2012). Specifically, we do not distinguish between types of discretionary purposes, i.e., income smoothing, capital management, or signaling. In this sense, we allow for different types of discretionary behavior to simultaneously offset the procyclicality of non-discretionary provisions, rather than focusing merely on the use of income smoothing as emphasized in Bouvatier and Lepetit (2012). We therefore follow Kanagaretnam et al. (2009) in grouping loan loss provisions into discretionary and non-discretionary provisions, which is explained in the next section.

### **3. Data, methodology and econometric specifications**

#### *3.1. Data sources*

From BankScope Fitch IBCA, we construct an unbalanced panel of annual bank-level data from 528 commercial banks in 11 countries in the Asia-Pacific region covering the 2002–2012 period. These countries are China (153), Hong Kong (39), India (60), Indonesia (72), Malaysia (31), South Korea (17), Taiwan (38), Thailand (18), Pakistan (23), Philippines (31), and Vietnam (46).<sup>2</sup> Moreover, we incorporate country-specific data such as real gross domestic product (*RGDP*) and short-term interest rate (*SHRATE*) retrieved from Thomson Reuters Datastream International.

As this study also assesses the influence of credit information sharing and the legal rights of borrowers on the link between loan loss provisions and bank lending, we also retrieve data

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<sup>2</sup> The numbers in parentheses represent the number of banks for each country in our sample.

country-level data on the credit reporting system and legal rights strength of each country. These data are collected from the Doing Business database provided by the World Bank. Doing Business 2004–2014 provides data on each country’s credit reporting system for January 2003 to January 2013. Therefore, such information reflects the situation at the end of each year from 2002 to 2012.

To account for the quality of credit information sharing, we consider the degree of credit information covered by private credit bureaus (*PRIVBUR*) and public credit registries (*PUBREG*) following Tsai et al. (2011). *PRIVBUR* and *PUBREG* describe the proportion of individuals and firms listed by a private credit bureau and a public credit registry, respectively. Information covered by these credit registries includes repayment history, unpaid debts, and outstanding credit. Higher *PRIVBUR* and *PUBREG* are associated with better credit information sharing. Information coverage by private credit bureaus is usually greater than that by public credit registries (Love and Mylenko, 2003). Private credit registries are more likely to collect information from various sources including non-bank creditors and to store more detailed information on borrowers. On the other hand, public credit registries tend to collect information only from supervised institutions and their information coverage is rather limited (Love and Mylenko, 2003).

We also consider the legal rights strength index (*LEGAL*) from Doing Business 2004–2014 to account for borrowers’ rights protections.<sup>3</sup> Consideration of the influence of borrowers’ legal rights on the relation between loan loss provisions and bank loan growth is relevant for the following reasons. It is widely perceived that stronger depositor protection through deposit

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<sup>3</sup> The value of *LEGAL* ranges from 0 to 12, where a higher value indicates stronger legal rights protections for borrowers.

insurance can reduce incentives for depositors to discipline bank risk taking (Barth et al., 2006). Arguably, increased borrower protection can also exacerbate entrepreneurial moral hazard, particularly in the presence of information asymmetry on the credit market. As loan loss provisioning systems form part of prudential regulations aiming to cope with bank credit risk, increased borrowers' moral hazard due to stronger borrowers' legal rights can cause risk-shifting from borrowers to banks *à la* Stiglitz and Weiss (1981). As such, stronger legal rights for borrowers might outweigh the role of loan loss provisions in mitigating credit risk and procyclical effects. On the other hand, Houston et al. (2010) emphasize that stronger protection of creditor rights is detrimental to financial stability, because it can increase incentives for creditors to undertake excessive risk taking. In this paper, we emphasize the strength of borrowers' legal rights and how they impact the procyclical effect of loan loss provisions on growth in bank lending. To the best of our knowledge, no prior study has examined how the legal rights of borrowers affect financial intermediation or stability.

### *3.2. Method*

As stated earlier, the objectives of our study are threefold. First, we examine the link between loan loss provisions and bank loan growth in order to highlight whether loan loss provisions are procyclical over the business cycle. Second, we examine whether information sharing and legal rights offset the procyclical effect of loan loss provisions and could substitute for a dynamic provisioning system. Third, in examining these issues, we consider the effect of bank size (i.e., large and small banks) to address the “too-big-to-fail” issues related to bank risk taking through lending activities.

We initially identify the determinants of loan loss provisions for all banks. We then estimate discretionary and non-discretionary loan loss provisions. Second, we examine the effect of both discretionary and non-discretionary loan loss provisions on bank loan growth. Third, we undertake a closer investigation of the influence of information sharing and legal rights on the link between loan loss provisions and loan growth in banking. Finally, in order to better understand the effect of bank size on these relationships, we repeat our tests with subsamples of large banks and small banks. These steps are explained further in the next section.

### 3.3. The determinants of bank loan loss provisions

In order to disentangle the discretionary and non-discretionary components of loan loss provisions, we initially estimate a LLP model with the ratio of loan loss provisions to total loans (*LLPL*) as a dependent variable following Kanagaretnam et al. (2009). We also use the ratio of total loan loss provisions to total assets (*LLPTA*) as a dependent variable in our tests. Specifically, we estimate the following equations:

$$\begin{aligned} LLPL_{i,t} = & a_0 + a_1 TIER1_{i,t-1} + a_2 CAR_{i,t-1} + a_3 CHLOAN_{i,t} + a_4 LLRTA_{i,t-1} \\ & + a_5 EBTPS_{i,t-1} + a_6 NPLTA_{i,t-1} + a_7 CHNPL_{i,t-1} + a_7 CHOFFTA_{i,t-1} + \varepsilon_{i,t} \end{aligned} \quad (1a)$$

$$\begin{aligned} LLPTA_{i,t} = & b_0 + b_1 TIER1_{i,t-1} + b_2 CAR_{i,t-1} + b_3 CHLOAN_{i,t} + b_4 LLRTA_{i,t-1} \\ & + b_5 EBTPS_{i,t-1} + b_6 NPLTA_{i,t-1} + b_7 CHNPL_{i,t-1} + b_7 CHOFFTA_{i,t-1} + \delta_{i,t} \end{aligned} \quad (1b)$$

Equations (1a) and (1b) are the models for our two measures of loan loss provisions (*LLPL* and *LLPTA*). *TIER1* is defined as Tier 1 risk adjusted capital, while *CAR* is total risk adjusted

capital. *CHLOAN* denotes change in total outstanding loans and *LLRTA* is loan loss allowance. *EBTPS* reflects earnings before tax, loan loss provisions, and special items. *NPL* and *CHNPL* represent total non-performing loans and change in total non-performing loans, respectively. Finally, *LCO* represents net loan charge-offs (write-offs). Because we consider both listed and non-listed banks in our sample, all of these variables are scaled by total bank assets rather than the market value of equity as in Kanagaretnam et al. (2009).

We compute the estimated values of discretionary and non-discretionary provisions in period  $t$  based on either equation (1a) or (1b). We follow Kanagaretnam et al. (2009), where non-discretionary provisions in period  $t$  (*NDISC*) are calculated by the fitted values of the LLP equation, while discretionary provisions in period  $t$  (*DISC*) are represented by the residuals of the LLP equation. We specify *NDISCL* and *NDISCTA* to reflect the non-discretionary loan loss provisions estimated from the *LLPL* and *LLPTA* models in equations (1a) and (1b), respectively. Likewise, *DISCL* and *DISCTA* are discretionary provisions calculated from the *LLPL* and *LLPTA* models, respectively.

### 3.3. Bank loan loss provisions and loan growth

Once the estimated discretionary and non-discretionary provisions have been estimated, we assess the impact of non-discretionary and discretionary provisions on bank loan growth. Following Bouvatier and Lepetit (2008), bank loan growth (*DLOAN*) is defined as the actual change in the ratio of total loans to total assets. More precisely, bank loan growth (*DLOAN*) is measured as:  $DLOAN_{i,t} = (L_{i,t} - L_{i,t-1}) / 0.5(T_{ai,t} + T_{ai,t-1})$ , where  $L$  is total loans. To test for robustness, we also use the simple annual growth of total loans (*LOANG*) as a dependent



variable. *LOANG* is calculated as the difference between total loans in period  $t$  and total loans in period  $t - 1$ , divided by total outstanding loans in period  $t - 1$ .

Bank loan growth is regressed against our variables of interest and several control variables that can affect bank loan growth using these equations following Bouvatier and Lepetit (2008):

$$\begin{aligned} DLOAN_{i,t} = & c_0 + c_1 DISC_{i,t} + c_2 NDISC_{i,t} + c_3 EQTA_{i,t} + c_4 DTA_{i,t} \\ & + c_5 SIZE_{i,t} + c_6 LR GDP_{i,t} + c_7 SHRATE_{i,t} + \theta_{i,t} \end{aligned} \quad (2a)$$

$$\begin{aligned} LOANG_{i,t} = & d_0 + d_1 DISC_{i,t} + d_2 NDISC_{i,t} + d_3 EQTA_{i,t} + d_4 DTA_{i,t} \\ & + d_5 SIZE_{i,t} + d_6 LR GDP_{i,t} + d_7 SHRATE_{i,t} + \delta_{i,t} \end{aligned} \quad (2b)$$

In equations (2a) and (2b), both *DISC* and *NDISC* are measured using either *LLPL* as in equation (1a), or *LLPTA* as in equation (1b).

To control for bank-specific factors in equations (2a) and (2b), we include several bank-specific variables. The ratio of total equity to total assets (*EQTA*) is included as a control variable because higher capitalization is expected to enhance a bank's capacity to grant new loans as described in the "capital crunch" literature (e.g., Bernanke and Lown, 1991; Peek and Rosengren, 1995). Building on Olivero et al. (2011), we consider the impact of bank liquidity and the "too-big-to-fail" effect on bank loan growth. However, we measure bank liquidity using the ratio of total deposits and short-term funding to total assets (*DTA*) instead of the ratio of liquid assets to total assets as in Olivero et al. (2011) due to data availability. We expect a positive relation between *DTA* and loan growth because banks with a greater funding base have greater liquidity and more capacity to boost lending activities. Because larger banks tend to behave imprudently due to the "too-big-to-fail" effect (Beck and Laeven, 2006), larger banks

might boost loan growth to generate profits. To account for bank size, we use the logarithm of bank total assets (*SIZE*).

Given that our sample of banks comes from different countries, controlling for country-specific factors is necessary. Following Olivero et al. (2011), we include the logarithm of real gross domestic product (*LRGDP*) and short-term interest rate (*SHRATE*) to account for each country's degree of economic development and the impact of its monetary policy, respectively. The role of monetary policy in bank lending and higher short-term interest rates' potential for tempering bank loan growth has been widely discussed.

### *3.4. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions*

In the next stage, we augment the analysis by assessing whether the procyclicality of loan loss provisions is conditional on credit information sharing and the strength of borrowers' legal rights. Our focus is examining the joint impact of discretionary provisions and country-specific factors. From these results, we can ascertain whether any procyclical effect of non-discretionary provisions can be offset by the countercyclical effect of discretionary provisions, which is also conditional on the extent to which credit information sharing and borrowers' legal rights are of better quality. If the countercyclical effect of discretionary provisions—which is dependent on the quality of credit information sharing and borrowers' legal rights—can offset the procyclical effect of non-discretionary loan loss provisions, then statistical provisions generated from a dynamic provisioning system might be unnecessary.

In examining the effect of information sharing on bank loan growth, we distinguish between the influence of private credit bureaus and public credit registries instead of investigating the influence of information sharing in general following Brown et al. (2009). Our approach to

defining information sharing therefore follows Tsai et al. (2011). This enables us to determine the type of information-sharing mechanism that matters for economic growth and financial stability to overcome the procyclicality of non-discretionary loan loss provisions.

For this purpose, we modify equations (2a) and (2b) to incorporate the interaction term between discretionary loan loss provisions and country-specific factors representing information sharing and borrowers' legal rights, as shown in equations (3), (4), and (5).<sup>4</sup>

$$\begin{aligned} GLOAN_{i,t} = & e_0 + e_1 DISC_{i,t} + e_2 NDISC_{i,t} + e_3 EQTA_{i,t} + e_4 DTA_{i,t} \\ & + e_5 SIZE_{i,t} + e_6 LRGDP_t + e_7 SHRATE_t \\ & + e_8 PRIVBUR_t + e_9 DISC * PRIVBUR_{i,t} + \gamma_{i,t} \end{aligned} \quad (3)$$

$$\begin{aligned} GLOAN_{i,t} = & f_0 + f_1 DISC_{i,t} + f_2 NDISC_{i,t} + f_3 EQTA_{i,t} + f_4 DTA_{i,t} \\ & + f_5 SIZE_{i,t} + f_6 LRGDP_t + f_7 SHRATE_t \\ & + f_8 PUBREG_t + f_9 DISC * PUBREG_{i,t} + \mu_{i,t} \end{aligned} \quad (4)$$

$$\begin{aligned} GLOAN_{i,t} = & g_0 + g_1 DISC_{i,t} + g_2 NDISC_{i,t} + g_3 EQTA_{i,t} + g_4 DTA_{i,t} \\ & + g_5 SIZE_{i,t} + g_6 LRGDP_t + g_7 SHRATE_t \\ & + g_8 LEGAL_t + g_9 DISC * LEGAL_{i,t} + \chi_{i,t} \end{aligned} \quad (5)$$

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<sup>4</sup> We interact each variable representing country-specific credit market environments (i.e., private credit bureaus, public credit registries, and borrowers' legal rights) with discretionary provisions instead of non-discretionary provisions, because only discretionary provisions can be adjusted by bank managers for capital management, signaling, or income smoothing purposes. Arguably, credit market environments at the country level can affect the extent to which capital management, signaling, or income smoothing plays a role and bank managers increase bank loan loss provisions. On the other hand, non-discretionary provisions cannot be easily adjusted to credit market environments because non-discretionary provisions are merely dependent on the degree of non-performing loans.

$GLOAN$  in the above equations is the measure of loan growth measured by either  $DLOAN$  or  $LOANG$ . Moreover,  $DISC$  and  $NDISC$  are two different measures depending on the definition of loan loss provisions used, as stated in section 3.3. with regard to equations (1a) and (1b).

### *3.5. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions: Large banks versus small banks*

In the final step, we examine whether large banks and small banks have different lending behavior in response to higher loan loss provisions. In order to classify banks as either large or small banks, we calculate the average of the logarithm of total assets for each bank in the whole period of observation (2002–2012). We then use the 75<sup>th</sup> percentile of these average values as a cut-off point. A bank is considered a large bank if its average logarithm of total assets exceeds its 75<sup>th</sup> percentile, and a bank is considered a small bank if its average logarithm of total assets is less than its 75<sup>th</sup> percentile. We construct a dummy variable ( $DSIZE$ ), taking a value of 1 if a bank is classified as a large bank and 0 otherwise. We re-estimate equations (2a), (2b), (3), (4), and (5) separately for large and small bank samples.

## **4. Empirical results**

### *4.1. Descriptive statistics and correlation structure*

Table 1 reports the descriptive statistics of all variables used in this study. Descriptive statistics for all variables are also reported separately for large and small banks. The descriptive statistics indicate that small banks exhibit higher loan loss provisions on average ( $LLPTA$  and  $LLPL$ ) than large banks. Small banks also exhibit higher average loan growth than large banks ( $DLOAN$  and  $LOANG$ ). These initial observations highlight differences between small and large

banks in terms of their lending behavior and procyclicality. Overall, all of the average values of bank-specific variables for small banks are higher than those for large banks.<sup>5</sup>

[Insert Table 1 here]

Table 2 reports the Pearson correlation coefficients for all bank-specific and country-specific variables used in this study. The correlations suggest that multicollinearity is not likely to be an issue because none of the independent variables are highly correlated.

[Insert Table 2 here]

## 4.2. Regression results

### 4.2.1. The determinants of bank loan loss provisions

In this stage, we estimate equations (1a) and (1b) to obtain coefficients related to factors affecting bank loan loss provisions. Table 3 reports our estimation results. Non-performing loans (*NPLTA*), change in non-performing loans (*CHNPL*) and net loan charge-offs (*CHOFFTA*) are associated with higher loan loss provisions measured by both *LLPTA* and *LLPL*. Meanwhile, the Tier 1 capital ratio (*RTIER1*) has a significant and positive association with *LLPTA* but no significant association with *LLPL*. Changes in total loans (*CHLOAN*) and loan loss reserves (*LLRTA*) have a negative association with both measures of loan loss provisions (*LLPTA* and *LLPL*). The negative association between *CHLOAN* and loan loss provisions (*LLPTA* and *LLPL*)

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<sup>5</sup> We performed simple comparisons between small banks and large banks for the various indicators presented in Table 1. The results of untabulated t-tests reveal that small banks and large banks are indeed different.

indicates that loan loss provisions are procyclical because increased loan activities reflecting economic boom periods tend to reduce loan loss provisions. This finding is consistent with Asea and Blomberg (1998), and Bouvatier and Lepetit (2008), who analyze US banks and European banks, respectively.

However, Kanagaretnam et al. (2009) show that the coefficient of *CHLOAN* in the loan loss provision regression is positive, suggesting that the banks in their sample behave prudently by building up loan loss provisions to cover default risk exposure following the expansion of lending activities. This also indicates that the procyclicality of the loan loss provisioning system is less likely to occur in their bank sample.

We also find that the earning variable (*EBTPS*) has no clear impact on loan loss provisions as reflected in its negative association with *LLPTA* and positive association with *LLPL*. This result suggests that the banks in our sample tend to use loan loss provisions for non-discretionary purposes, particularly to deal with higher non-performing loans and charge-offs. In other words, banks increase loan loss provisions because their expected credit risk increases.

[Insert Table 3 here]

#### *4.2.2. Bank loan loss provisions and loan growth*

In this section, we differentiate the effects of non-discretionary and discretionary loan loss provisions on bank lending. Specifically, we aim to assess what types of provisions amplify business cycle fluctuations through bank lending.

[Insert Table 4 here]

The results reported in Table 4 indicate that only non-discretionary loan loss provisions amplify procyclical effects because higher non-discretionary loan loss provisions tend to reduce bank loan growth. This result is robust for our different measures of non-discretionary loan loss provisions and bank loan growth. The bank capital ratio (*EQTA*) is negatively linked to bank loan growth measured by *LOANG*, while the deposits-to-assets ratio (*DTA*) exhibits no significant association with bank loan growth. Bank size (*SIZE*) has a significant and positive association with bank loan growth. This follows from the notion that bank risk taking—which might come from greater lending activities—increases due the “too-big-to-fail” effect as the asset size of banks increases (Beck and Laeven, 2006; Mishkin, 2006; Kane, 2000).

With regard to country-specific control variables, only short-term interest rate (*SHRATE*) is significant, and it has a negative association with bank loan growth. This result suggests that the bank lending channel occurs in Asian banks, following Olivero et al. (2011).

#### *4.2.3. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions*

To test whether information sharing and borrowers’ legal rights offset the procyclical effect of non-discretionary loan loss provisions, we estimate equations (3) to (5). Table 5 presents our results when the effect of private credit bureaus is taken into consideration, while Tables 6 and 7 report our results regarding the influence of public credit registries and borrowers’ legal rights, respectively.

Consistent with our previous results, the results reported in Table 5 initially indicate that non-discretionary loan loss provisions exhibit a procyclical effect because of the negative link

between non-discretionary provisions (*NDISCTA* and *NDISCL*) and bank loan growth (*DLOAN* and *LOANG*). This procyclical effect is not offset by discretionary provisions (measured by *DISCTA* or *DISCL*) because discretionary provisions do not have a significant association with bank loan growth. In this respect, there is no countercyclical effect of discretionary provisions to offset the procyclicality of non-discretionary provisions.

Table 5 documents the negative and significant coefficients of the interactions between discretionary loan loss provisions (*DISCTA* or *DISCL*) and private credit bureaus (*PRIVBUR*), but the stand-alone explanatory variables have no significant impact on bank loan growth. This suggests that, if the quality of private credit bureaus exceeds a certain level, then the link between discretionary provisions and bank loan growth becomes negative.<sup>6</sup> Given the negative coefficients of non-discretionary provisions (*NDISCTA* or *NDISCL*), and the negative coefficients of the interaction terms between discretionary provisions and private credit bureaus, the presence of private credit bureaus is not sufficient to overcome the procyclicality of loan loss

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<sup>6</sup> By considering equation (3) and the relevant results of Table 5 we generate the following equation:  $DLOAN = 0.1128*DISCTA - 1.3869*DISCTA*PRIVBUR$ . In the presence of private credit bureaus, the marginal effect on bank loan growth of an increase in discretionary provisions can be determined by taking a partial derivative with respect to *DISCTA* and we obtain:

$$\frac{\partial DLOAN}{\partial DISCTA} = 0.1128 - 1.3869 * PRIVBUR$$

Now if we substitute 0.1736 (Table 1 value for *PRIVBUR* for all banks) into the preceding we obtain:  $0.1128 - 1.3869*0.1736 = -0.12797 < 0$ . This suggests that loan growth decreases with improved information and hence decreases the pro-cyclical effect. Alternatively it suggests that the cut-off point of *PRIVBUR* is  $0.1128/1.3869 = 0.0813$ . This means that the negative link between discretionary provisions (*DISCTA*) and bank loan growth (*DLOAN*) occurs if the level of private credit bureaus coverage exceeds 8.13%.



provisions. This is because discretionary provisions also become procyclical once a certain level of quality of private credit bureaus has been reached. In other words, for countries with better private credit bureaus, the procyclicality of non-discretionary provisions shown by the negative sign of *NDISCTA* or *NDISCL* is aggravated by the procyclicality of discretionary provisions.

[Insert Table 5 here]

Next, we examine the influence of information sharing, measured by the quality of public credit registries (*PUBREG*) on the link between discretionary provisions and loan growth. Our aim is to test whether the quality of information sharing provided by public credit registries offsets the procyclicality of non-discretionary provisions.

In Table 6, the interaction terms between discretionary loan loss provisions (*DISCTA* and *DISCL*) and public credit registries (*PUBREG*) exhibit a positive and significant impact on bank loan growth. Moreover, the sum of the coefficients of *DISCTA* (or *DISCL*) and the interaction terms are higher than the coefficients of non-discretionary provisions (*NDISCTA* and *NDISCL*).<sup>7</sup> Hence, higher discretionary provisions in countries with better public credit registries offset the

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<sup>7</sup> In the presence of public credit registries, the marginal effect on bank loan growth of an increase in discretionary provisions (*DISCTA*) can be calculated as  $f_1 + f_9 \text{PUBREG}$ , which is positive for values of *PUBREG* higher than  $0.3619/2.1265 = 0.1702$ . The net effect of *DISCTA* is equal to the sum of *DISCTA* and *DISCTA\*PUBREG* (1.7646), which is higher than the negative coefficient of *NDISCTA* (-0.4567). Overall, this suggests that the net positive impact of *DISCTA* on bank loan growth after a certain level of public credit registry quality is reached outweighs the negative impact of *NDISCTA* on bank loan growth. Hence, the countercyclical effect of discretionary provisions offsets the procyclical effect of non-discretionary provisions when the coverage of public credit registries exceeds 17.02%.

procyclical impact of non-discretionary provisions on bank loan growth. For this reason, a dynamic provisioning system to cope with the procyclicality of non-discretionary provisions could be replaced by high quality public credit registries.

[Insert Table 6 here]

In Table 7, we examine the effect of interaction terms between discretionary provisions (*DISCTA* or *DISCL*) and borrowers' legal rights (*LEGAL*) on bank loan growth. Higher discretionary provisions in countries with stronger legal rights for borrowers (*DISCTA\*LEGAL* or *DISCL\*LEGAL*) exhibit a positive impact on bank loan growth. However, the positive effect related to the sum of the coefficients of discretionary provisions and such interaction terms with borrowers' legal rights is smaller than the negative coefficients of non-discretionary provisions. Accordingly, stronger legal rights for borrowers combined with higher discretionary provisions temper the procyclicality of non-discretionary provisions on bank loan growth.

[Insert Table 7 here]

#### *4.2.4. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions: Large banks versus small banks*

In this section, we differentiate the effect of information sharing and legal rights for borrowers on the procyclical impact of loan loss provisions with respect to bank size. Table 8 shows that, for large banks, both non-discretionary and discretionary loan loss provisions have a

procyclical impact on bank lending because both discretionary and non-discretionary provisions are negatively associated with bank loan growth.

[Insert Table 8 here]

In Table 9, we document that, for large banks, the coefficients of the interaction terms between discretionary provisions and private credit bureaus ( $DISCL*PRIVBUR$ ) are higher than the coefficients of discretionary loan loss provisions ( $DISCL$ ). This indicates that, after the quality of private credit bureaus ( $PRIVBUR$ ) reaches a certain level, discretionary provisions can become countercyclical due to the positive link between discretionary provisions and bank loan growth.<sup>8</sup> Nevertheless, the countercyclical effect of discretionary provisions for large banks in countries with better quality  $PRIVBUR$  cannot offset the procyclical effect of non-discretionary provisions measured by  $NDISCL$ . This is because the negative coefficients of  $NDISCL$  are higher than the sum of the coefficients of  $DISCL$  and  $DISCL*PRIVBUR$ .

[Insert Table 9 here]

In Table 10, the coefficients for the interaction terms between discretionary loan loss provisions and public credit registries ( $DISCTA*PUBREG$  or  $DISCL*PUBREG$ ) are not statistically significant for our sample of large banks, whereas both discretionary and non-

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<sup>8</sup> For instance, if  $DLOAN$  is used as a measure of bank loan growth as in Table 9 (column 3), the cut-off point of  $PRIVBUR$  is equal to  $2.7393/3.8699 = 70.8\%$ . If  $LOANG$  is used as a measure of bank loan growth as in Table 9 (column 4), the cut-off point of  $PRIVBUR$  is equal to  $7.6799/12.3646 = 62.1\%$ .

discretionary provisions are negatively associated with bank loan growth. These results highlight that both types of provisions are procyclical, while such procyclical effects cannot be offset by the role of public credit registries.

[Insert Table 10 here]

In Table 11, we report that the degree of borrowers' legal rights has no significant effect on the procyclicality of loan loss provisions. We also find that both discretionary and non-discretionary provisions are procyclical. Overall, we find that the procyclicality of non-discretionary provisions for large banks cannot be offset by discretionary provisions or by the quality of private credit bureaus, private credit registries, or borrowers' legal rights. For large banks, a dynamic provisioning system can therefore be necessary to increase statistical provisions in order to cope with the procyclicality of non-discretionary provisions that amplify business cycle fluctuations.

[Insert Table 11 here]

Tables 12 to 15 report the results from re-estimating equations (2) to (5) for our sample of small banks. As reported in Table 12, only non-discretionary provisions (*NDISCTA* and *NDISCL*) have a significant and negative association with bank loan growth (*DLOAN* and *LOANG*). In Table 13, we further document that the procyclical effect of loan loss provisions on small banks cannot be offset by the role of private credit bureaus (*PRIVBUR*). In this regard, the sum of coefficients of the interaction terms (*DISCTA\*PRIVBUR* or *DISCL\*PRIVBUR*) and

discretionary provisions (*DISCTA* and *DISCL*) are negative, increasing the magnitude of the negative coefficients of non-discretionary provisions.

[Insert Table 12, 13, 14, and 15 here]

Tables 14 and 15 present our results when we take into account the effect of public credit registries and borrowers' legal rights, respectively. We find strong evidence that better public credit registries and stronger legal rights for borrowers, combined with higher discretionary provisions, offset the procyclicality of non-discretionary loan loss provisions. The results reported in Table 14 show that discretionary provisions are countercyclical and their countercyclical effect is higher than the procyclical effect of non-discretionary provisions, especially after the quality of public credit registries (*PUBREG*) reaches a certain level.<sup>9</sup> Similarly, the results in Table 15 suggest that discretionary provisions can become countercyclical, and their countercyclical effect is greater than the procyclical effect of non-discretionary provisions, especially after the degree of borrowers' legal rights (*LEGAL*) reaches a certain level.

On the whole, we find that discretionary loan loss provision use is sufficient to offset the procyclicality of non-discretionary loan loss provisions for small banks in countries with better quality public credit bureaus and stronger legal rights for borrowers. In other words, a dynamic

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<sup>9</sup> For instance, column 1 (Table 14) shows that the cut-off point of *PUBREG* is equal to  $0.2113/1.5881 = 13.3\%$ . The sum of the coefficient of discretionary provisions (*DISCTA*) and the interaction term (*DISCTA\*PUBREG*) is equal to 1.5881, which is also higher than the negative coefficient of non-discretionary provisions (0.4558). Accordingly, the net effect of loan loss provisions is equal to  $1.5881 - 0.4558 = 1.1323$ . In this regard, loan loss provisions for small banks are countercyclical, especially after *PUBREG* reaches 13.3%.

provisioning system that increases statistical provisions might not be crucial for small banks if public credit registries and borrower's legal rights are of sufficient quality. Strengthening public credit registries and borrowers' legal rights might therefore be an option for coping with the procyclicality of non-discretionary provisions instead of forcing small banks to implement a dynamic provisioning system.

## **5. Conclusion**

We examine the effect of loan loss provisions on the lending behavior of banks by considering the influence of credit information sharing and legal rights for borrowers. In general, we show that the non-discretionary loan loss provisions of Asian banks are procyclical because higher non-discretionary loan loss provisions are significantly associated with a decline in bank loan growth. This procyclical effect for non-discretionary loan loss provisions occurs in both large and small banks. For large banks, we also find that discretionary loan loss provisions exhibit a procyclical effect, as discretionary loan loss provisions in large banks are negatively associated with loan growth.

Furthermore, we generally document that, for all banks, credit information sharing and legal rights for borrowers can reduce the procyclicality of non-discretionary loan loss provisions. Specifically, higher discretionary loan loss provisions of banks in countries with better quality public credit registries (but not private credit bureaus) and stronger legal rights for borrowers can offset, or at least temper, the negative impact of non-discretionary loan loss provisions on bank loan growth. However, these results only hold for our sample of small banks. In other words, we find evidence that small banks in countries with better public credit registries and stronger legal rights for borrowers can simply use discretionary loan loss provisions to offset the procyclicality

of non-discretionary loan loss provisions. For small banks, higher discretionary loan loss provisions, combined with better quality public credit registries or borrowers' legal rights, are significantly associated with an increase in loan growth. This positive effect for discretionary loan loss provisions is greater than the negative effect of non-discretionary loan loss provisions on loan growth. Small banks in countries with better public credit registries and stronger legal rights for borrowers do not require a dynamic provisioning system to overcome their procyclical behavior—although we do not discourage small banks from implementing a dynamic provisioning system.

In contrast, we do not find that high quality private credit bureaus, public credit registries, or legal rights for borrowers offset the procyclicality of non-discretionary loan loss provisions in large banks. In this regard, the implementation of a dynamic provisioning system is more important for large banks than for small banks. Hence, bank regulators need to pay closer attention to large banks' implementation of dynamic provisioning systems. This is because higher non-discretionary loan loss provisions in large banks reduce loan growth, and this reduction cannot be simply offset by discretionary loan loss provisions even if the quality of credit information sharing and legal rights of borrowers are strengthened.

Overall, our study identifies those conditions in which a dynamic provisioning system can mitigate the procyclical behavior of Asian banks. Our study is important because all Asian banks do not have the same capacity to implement a dynamic provisioning system. Similarly, regarding the procyclical effect of loan loss provisions, non-discretionary provisions can vary from country to country depending on the strength of public credit registries and the legal rights of borrowers. In this respect, each country has different macroeconomic environments that determine the effectiveness of dynamic provisioning systems.

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**Table 1.** Descriptive statistics

Variables	All banks			Large banks			Small banks		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
<b><i>Loan loss provisions</i></b>									
<i>LLPL</i>	0.0081	0.0057	0.0316	0.0080	0.0055	0.0096	0.0081	0.0058	0.0365
<i>LLPTA</i>	0.0049	0.0030	0.0232	0.0045	0.0031	0.0058	0.0050	0.0029	0.0268
<i>LLRTA</i>	0.0196	0.0107	0.0521	0.0148	0.0096	0.0175	0.0214	0.0114	0.0597
<b><i>Capital adequacy ratios</i></b>									
<i>RTIER1</i>	0.1636	0.1100	0.2594	0.1031	0.0973	0.0339	0.1916	0.1190	0.3089
<i>CAR</i>	0.1931	0.1381	0.2483	0.1345	0.1308	0.0400	0.2172	0.1441	0.2905
<i>EQTA</i>	0.1144	0.0789	0.1210	0.0680	0.0645	0.0274	0.1308	0.0898	0.1361
<b><i>Loan growth</i></b>									
<i>DLOAN</i>	0.1013	0.0934	0.1214	0.0881	0.0870	0.0751	0.1061	0.0963	0.1341
<i>LOANG</i>	0.2224	0.2035	0.2202	0.1871	0.1826	0.1571	0.2360	0.2123	0.2389
<i>CHLOAN</i>	0.0856	0.0853	0.1065	0.0790	0.0802	0.0660	0.0881	0.0881	0.1178
<b><i>Non-performing loans</i></b>									
<i>NPLTA</i>	0.0256	0.0128	0.0438	0.0206	0.0097	0.0315	0.0276	0.0143	0.0476
<i>CHNPL</i>	-0.0413	-0.0080	1.9045	-0.1404	-0.0224	1.2089	-0.0009	-0.0005	2.1227
<i>CHOFFTA</i>	0.0034	0.0012	0.0095	0.0034	0.0015	0.0068	0.0034	0.0010	0.0106
<b><i>Information sharing</i></b>									
<i>PRIVBUR</i>	0.1736	0.0000	0.3039	0.3161	0.1020	0.3805	0.1286	0.0000	0.2660
<i>PUBREG</i>	0.1244	0.0080	0.1873	0.1344	0.0000	0.2511	0.1222	0.0460	0.1620
<b><i>Legal rights of borrowers</i></b>									
<i>LEGAL</i>	5.94	5.00	2.13	6.26	5.00	2.35	5.82	5.00	2.06
<b><i>Control variables</i></b>									
<i>EBTPS</i>	0.0180	0.0167	0.0275	0.0164	0.0157	0.0084	0.0186	0.0174	0.0317
<i>DTA</i>	0.8115	0.8510	0.1410	0.8490	0.8681	0.0993	0.7981	0.8430	0.1509
<i>SIZE</i>	15.1578	15.2605	1.9815	17.4306	17.1988	1.1503	14.3517	14.5815	1.5387
<i>LGDP</i>	13.1775	14.1097	2.0738	12.9685	13.3533	2.1604	13.2521	14.2056	2.0420
<i>SHRATE</i>	0.0507	0.0390	0.0354	0.0361	0.0317	0.0245	0.0548	0.0447	0.0371

**Table 2.** Correlation coefficients

Variables	<i>LLPL</i>	<i>LLPTA</i>	<i>DLOAN</i>	<i>LOANG</i>	<i>RTIER1</i>	<i>CAR</i>	<i>CHLOAN</i>	<i>LLRTA</i>	<i>EBTPS</i>	<i>NPLTA</i>	<i>CHNPL</i>
<i>LLPL</i>	1.0000										
<i>LLPTA</i>	0.6447	1.0000									
<i>DLOAN</i>	0.0040	-0.0286	1.0000								
<i>LOANG</i>	-0.0508	-0.0526	0.9048	1.0000							
<i>RTIER1</i>	-0.2496	-0.1030	-0.1284	-0.0138	1.0000						
<i>CAR</i>	-0.2743	-0.1066	-0.1211	0.0088	0.9881	1.0000					
<i>CHLOAN</i>	0.0227	-0.0172	0.9484	0.8889	-0.1508	-0.1421	1.0000				
<i>LLRTA</i>	0.0416	0.0748	-0.1470	-0.1310	0.0885	0.0034	-0.1557	1.0000			
<i>EBTPS</i>	0.0732	-0.0049	-0.0161	0.0485	-0.0039	0.0300	-0.0015	0.0972	1.0000		
<i>NPLTA</i>	0.1560	0.1943	-0.1830	-0.1838	0.1109	-0.0264	-0.1856	0.7914	0.0318	1.0000	
<i>CHNPL</i>	0.2160	0.3658	0.0506	0.0285	-0.1082	-0.1456	0.0416	0.0483	-0.0889	0.1596	1.0000
<i>CHOFFTA</i>	0.2802	0.1428	-0.1110	-0.0813	-0.0210	0.0376	-0.1010	0.1426	0.0783	0.1360	-0.3791
<i>EQTA</i>	-0.0878	-0.1289	-0.0852	-0.0093	0.6952	0.6788	-0.1346	0.0805	0.0799	0.1082	-0.1588
<i>DTA</i>	0.0936	0.0650	0.1200	0.0445	-0.5589	-0.5395	0.1604	-0.1919	-0.1552	-0.1582	0.0623
<i>SIZE</i>	0.0594	0.0263	-0.0622	-0.0908	-0.4222	-0.4282	-0.0195	-0.1696	-0.0220	-0.2379	0.0326
<i>LG DPR</i>	0.0317	0.0392	-0.1029	-0.1584	0.0423	0.0420	-0.1142	0.1207	-0.0109	0.1587	0.0782
<i>SHRATE</i>	0.0437	0.0315	0.0072	-0.0099	-0.1012	-0.0247	0.0075	0.0753	0.0750	0.0721	0.1337
<i>PRIVBUR</i>	-0.0217	-0.0139	-0.1961	-0.2193	0.1119	0.0893	-0.2013	-0.0579	-0.0907	-0.0954	-0.0239
<i>PUBREG</i>	-0.0845	-0.0159	0.0095	0.0230	0.0754	0.0735	0.0116	-0.1028	0.0110	-0.1660	0.0116
<i>LEGAL</i>	-0.0346	-0.0484	-0.0863	-0.0625	0.1226	0.1371	-0.1013	-0.0876	-0.0099	-0.1368	0.0058

Variables	<i>CHOFFTA</i>	<i>EQTA</i>	<i>DTA</i>	<i>SIZE</i>	<i>LGDP</i>	<i>SHR</i>	<i>PRIVBUR</i>	<i>PUBREG</i>	<i>LEGAL</i>
<i>CHOFFTA</i>	1								
<i>EQTA</i>	0.0531	1							
<i>DTA</i>	-0.0734	-0.8543	1						
<i>SIZE</i>	-0.0539	-0.5165	0.4206	1					
<i>LGDP</i>	0.0209	0.1384	-0.1808	-0.1740	1				
<i>SHR</i>	-0.0160	-0.0307	-0.0369	-0.1743	0.2476	1			
<i>PRIVBUR</i>	0.0239	0.1388	-0.1336	0.0950	0.3118	-0.3852	1		
<i>PUBREG</i>	-0.1321	-0.0092	-0.0104	0.0817	0.0056	0.0713	0.0389	1	
<i>LEGAL</i>	-0.1258	0.1106	-0.1364	0.0063	0.1653	0.1149	0.4621	0.2961	1

**Table 3.** The determinants of loan loss provisions in banking

Explanatory variables	<i>LLPTA</i>		<i>LLPL</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>RTIER1(-1)</i>	0.0343*	1.9605	-0.0027	-0.3402
<i>CAR(-1)</i>	-0.0115	-0.5596	-0.0371***	-3.9739
<i>CHLOAN</i>	-0.0212**	-2.3828	-0.0114***	-2.8172
<i>LLRTA(-1)</i>	-1.1603***	-13.417	-0.2716***	-6.4866
<i>EBTPS</i>	-1.1700***	-15.0759	0.1728***	4.3119
<i>NPLTA(-1)</i>	0.3459***	5.8196	0.2171***	7.9951
<i>CHNPL</i>	0.0104***	17.2648	0.0047***	16.1862
<i>LCO</i>	1.4453***	11.2494	0.8738***	14.5973
Observations	1299		1298	
R-squared	0.7089		0.3938	
F-statistic	7.2331***		104.6929***	

**Notes:** Dependent variables are *LLPTA* (the ratio of loan loss provisions to total assets) or *LLPL* (the ratio of loan loss provisions to total loans). *CAR* is the ratio of total capital to risk-weighted assets. *CHLOAN* denotes change in total outstanding loans. *LLRTA* is loan loss allowance to total assets. *EBTPS* reflects earnings before tax, loan loss provisions, and special items divided by total assets. *NPL* and *CHNPL* represent the ratio of total non-performing loans to total assets and change in total non-performing loans, respectively. Finally, *CHOFFTA* represents the ratio of net loan charge-offs (write-offs) to total assets. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.



**Table 4.** Loan loss provisions and loan growth for all banks

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-0.0299	-0.2471	-0.0936	-0.4024				
<i>NDISCTA</i>	-0.3032***	-2.7095	-0.5797***	-2.6704				
<i>DISCL</i>					-0.4718	-1.1127	-0.6834	-1.3709
<i>NDISCL</i>					-2.1512***	-3.7347	-4.1589***	-6.2076
<i>EQTA</i>	-0.2017	-1.1051	-0.4795*	-1.7903	-0.1843	-0.8372	-0.4052	-1.5336
<i>DTA</i>	-0.0789	-0.8518	-0.1373	-0.8993	-0.1240	-1.1799	-0.1644	-1.0946
<i>SIZE</i>	0.0711***	3.8038	0.1004***	3.4140	0.0806***	3.5319	0.1163***	3.9901
<i>LGDPR</i>	-0.0969	-1.5707	-0.0303	-0.2559	-0.1300	-1.6424	-0.0883	-0.7577
<i>SHRATE</i>	-1.0425***	-5.5349	-2.2065***	-6.0711	-1.0176***	-4.6068	-2.1692***	-6.0741
Observations	1298		1272		1297		1271	
R-squared	0.5807		0.5519		0.5983		0.5674	
F-statistic	4.1425***		3.5993***		4.4496***		3.8295***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 5.** Loan loss provisions and loan growth for all banks: Do private credit bureaus matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	0.1128	0.8156	0.1546	0.6465				
<i>NDISCTA</i>	-0.3977***	-2.9725	-0.7574***	-2.7448				
<i>DISCL</i>					-0.1110	-0.3692	0.1077	0.1695
<i>NDISCL</i>					-2.1508***	-6.8336	-4.0790***	-6.0902
<i>EQTA</i>	-0.1698	-1.1329	-0.4619**	-1.9873	-0.1762	-1.5080	-0.4125	-1.5484
<i>DTA</i>	-0.0537	-0.4989	-0.1133	-0.4561	-0.0899	-1.2377	-0.1423	-0.9247
<i>SIZE</i>	0.0762***	3.6855	0.1084**	2.5786	0.0843***	5.9946	0.1254***	4.2748
<i>LGDPR</i>	-0.0699	-0.8925	0.0013	0.0079	-0.1009*	-1.7233	-0.0645	-0.5347
<i>SHRATE</i>	-1.0373***	-2.6429	-2.1887***	-2.6485	-1.0420***	-5.9289	-2.2129***	-6.1983
<i>PRIVBUR</i>	0.0453	1.5816	0.0609	0.8408	0.0425**	2.0341	0.0511	1.1575
<i>DISCTA*PRIVBUR</i>	-1.3869*	-1.6604	-2.6228**	-1.7394				
<i>DISCL*PRIVBUR</i>					-1.4558*	-1.8971	-3.3121**	-2.0066
Observations	1298		1272		1297		1271	
R-squared	0.5847		0.5545		0.6015		0.5699	
F-statistic	4.1767***		3.6095***		4.4731***		3.8370***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PRIVBUR* is the proportion of individuals and firms listed by a private credit bureau. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 6.** Loan loss provisions and loan growth for all banks: Do public credit registries matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-0.3619*	-1.6632	-0.5826	-0.9283				
<i>NDISCTA</i>	-0.4567***	-3.4218	-0.8186***	-2.9803				
<i>DISCL</i>					-0.7819***	-2.7717	-1.1705**	-2.0993
<i>NDISCL</i>					-2.1697***	-6.8640	-4.1665***	-4.8293
<i>EQTA</i>	-0.1885***	-1.6035	-0.4759***	-2.5399	-0.1813	-1.5697	-0.3919***	-2.9474
<i>DTA</i>	-0.0877	-1.2254	-0.1589	-0.6466	-0.1289*	-1.8321	-0.1783	-0.7932
<i>SIZE</i>	0.0782***	5.3323	0.1124***	2.6199	0.0841***	5.8333	0.1241***	3.3402
<i>LGDPR</i>	-0.0916	-1.5759	-0.0171	-0.0809	-0.1244**	-2.1829	-0.0844	-0.3928
<i>SHRATE</i>	-1.0288***	-5.7241	-2.1857***	-2.6988	-1.0199***	-5.7944	-2.1686***	-2.8685
<i>PUBREG</i>	-0.0699	-1.4405	-0.1213	-0.8566	-0.0427	-0.8987	-0.0804	-0.5641
<i>DISCTA*PUBREG</i>	2.1265**	1.8456	3.1589*	0.8874				
<i>DISCL*PUBREG</i>					3.5615**	2.0675	6.5730**	2.3258
Observations	1298		1272		1297		1271	
R-squared	0.5830		0.5533		0.6004		0.5689	
F-statistic	4.1478***		3.5909***		4.4522***		3.8213***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PUBREG* is the proportion of individuals and firms listed by a public credit registry. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 7.** Loan loss provisions and loan growth for all banks: Do borrowers' legal rights matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-0.0389	-0.0713	-2.3017***	-2.7017				
<i>NDISCTA</i>	-0.2902***	-2.7208	-0.5031**	-2.3780				
<i>DISCL</i>					-3.1598***	-7.7593	-8.1523***	-5.4426
<i>NDISCL</i>					-2.1996***	-6.8869	-4.2818***	-5.3143
<i>EQTA</i>	-0.1949*	-1.6528	-0.4959**	-2.4985	-0.1347	-1.3035	-0.4142***	-3.0302
<i>DTA</i>	-0.0838	-1.1665	-0.1304	-0.5398	-0.1176	-1.2358	-0.1537	-0.7339
<i>SIZE</i>	0.0747***	5.1287	0.1018**	2.4265	0.0796***	4.1059	0.1146***	2.8792
<i>LGDPR</i>	-0.1346**	-2.0373	-0.0594	-0.2447	-0.1246	-1.1455	-0.0596	-0.2340
<i>SHRATE</i>	-1.0686***	-5.8972	-2.2395***	-2.8789	-1.0111***	-3.0959	-2.1220***	-2.9244
<i>LEGAL</i>	0.0113	1.1724	0.0129	0.6954	0.0007	0.0691	-0.0052	-0.2542
<i>DISCTA*LEGAL</i>	0.0019	0.0184	0.4251***	2.8051				
<i>DISCL*LEGAL</i>					0.4829***	5.8487	1.3854***	5.3672
Observations	1298		1272		1297		1271	
R-squared	0.5813		0.5539		0.6028		0.5738	
F-statistic	4.1187***		3.5988***		4.4976***		3.8993***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *LEGAL* is the strength of borrowers' legal rights developed by the Doing Business database. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 8.** Loan loss provisions and loan growth for large bank sample

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-2.6547***	-3.6877	-4.7344***	-3.2464				
<i>NDISCTA</i>	-2.5661***	-3.7126	-4.5915***	-3.2917				
<i>DISCL</i>					-1.4626*	-1.7393	-2.2603**	-2.2973
<i>NDISCL</i>					-2.8158**	-2.4237	-5.8621***	-4.3522
<i>EQTA</i>	-0.2059	-0.6861	0.5247	0.8489	-0.2901	-0.6302	0.2191	0.3538
<i>DTA</i>	-0.2049	-1.2825	-0.2259	-0.7057	-0.2296	-0.7712	-0.2656	-0.8406
<i>SIZE</i>	0.1432***	5.3932	0.1973***	3.4568	0.1479***	5.9142	0.2177***	3.8657
<i>LGDP</i>	-0.1479*	-1.7953	-0.0601	-0.3540	-0.1441	-1.0707	-0.0650	-0.3879
<i>SHRATE</i>	-1.1256***	-3.4242	-2.3136***	-3.5221	-1.1818*	-2.2693	-2.4619***	-3.7893
Observations	481		478		481		478	
R-squared	0.3037		0.3380		0.3188		0.3544	
F-statistic	2.9211***		3.2347***		3.0614***		3.4029***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDP* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 9.** Loan loss provisions and loan growth for large bank sample: Do private credit bureaus matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-2.7338***	-3.5601	-4.7818***	-3.0670				
<i>NDISCTA</i>	-2.5161***	-3.6469	-4.5319***	-3.2390				
<i>DISCL</i>					-2.7393***	-3.3736	-6.1875***	-3.7755
<i>NDISCL</i>					-3.3731***	-4.7521	-7.6799***	-5.2858
<i>EQTA</i>	-0.1107	-0.3684	0.6119	0.9879	-0.1279	-0.4248	0.6346	1.0206
<i>DTA</i>	-0.2068	-1.2988	-0.2341	-0.7287	-0.2031	-1.2923	-0.1707	-0.5439
<i>SIZE</i>	0.1459***	5.5253	0.2075***	3.6037	0.1519***	5.8711	0.2272***	4.0834
<i>LGDPR</i>	-0.0591	-0.6652	0.0450	0.2480	-0.0597	-0.6807	0.0394	0.2225
<i>SHRATE</i>	-1.2276***	-3.7335	-2.4454***	-3.7014	-1.1299***	-3.4171	-2.1129***	-3.1892
<i>PRIVBUR</i>	0.1095**	2.5142	0.1484*	1.6659	0.1164***	2.7162	0.1730**	1.9932
<i>DISCTA*PRIVBUR</i>	0.8618	0.8274	0.9369	0.4044				
<i>DISCL*PRIVBUR</i>					3.8699**	2.0807	12.3646***	3.0703
Observations	481		478		481		478	
R-squared	0.3130		0.3397		0.3351		0.3727	
F-statistic	2.9707***		3.2111***		3.1794***		3.5534***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PRIVBUR* is the proportion of individuals and firms listed by a private credit bureau. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 10.** Loan loss provisions and loan growth for large bank sample: Do public credit registries matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-2.4464***	-3.5441	-4.8505***	-3.2048				
<i>NDISCTA</i>	-2.4715***	-5.2810	-4.4946***	-3.6715				
<i>DISCL</i>					-1.3760***	-2.7166	-2.2354**	-2.1128
<i>NDISCL</i>					-2.7542***	-4.0707	-5.5879***	-4.0624
<i>EQTA</i>	-0.2309	-0.4939	0.3698	0.3376	-0.3210	-1.0737	0.1548	0.2515
<i>DTA</i>	-0.2824	-1.0146	-0.4088	-0.8586	-0.3026*	-1.8840	-0.4299	-1.3413
<i>SIZE</i>	0.1423***	4.9985	0.1966**	2.4953	0.1478***	5.6806	0.2158***	3.8565
<i>LGDPR</i>	-0.0760	-0.5157	0.0569	0.1758	-0.0794	-0.9315	0.0691	0.3958
<i>SHRATE</i>	-1.0438**	-2.0522	-2.1135**	-2.0655	-1.0748***	-3.2857	-2.2530***	-3.4541
<i>PUBREG</i>	-0.1527**	-2.0972	-0.3248***	-2.6401	-0.1483**	-2.4489	-0.3157***	-2.6156
<i>DISCTA*PUBREG</i>	-1.7936	-0.3292	5.7263	1.1293				
<i>DISCL*PUBREG</i>					-2.4895	-0.6133	-1.7347	-0.2099
Observations	481		478		481		478	
R-squared	0.3122		0.3497		0.3263		0.3628	
F-statistic	2.9629***		3.3106***		3.0945***		3.4473***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PUBREG* is the proportion of individuals and firms listed by a public credit registry. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 11.** Loan loss provisions and loan growth for large bank sample: Do borrowers' legal rights matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-2.2932***	-1.8412	-5.2622***	-2.7008				
<i>NDISCTA</i>	-2.5085***	-3.4616	-4.5227***	-3.3881				
<i>DISCL</i>					-2.7271	-1.1069	-6.1891	-1.3808
<i>NDISCL</i>					-2.7415***	-2.6865	-5.6859***	-2.6964
<i>EQTA</i>	-0.2001	-0.5666	0.4818	0.7184	-0.3004	-0.9499	0.1975	0.3338
<i>DTA</i>	-0.2131	-0.8130	-0.2269	-0.4743	-0.2347	-0.8808	-0.2698	-0.5504
<i>SIZE</i>	0.1434***	3.5939	0.1986**	2.3122	0.1498***	3.8243	0.2223***	2.6181
<i>LGDPR</i>	-0.1604	-1.5919	-0.0786	-0.4197	-0.1596	-1.5703	-0.0942	-0.4929
<i>SHRATE</i>	-1.1378***	-3.7820	-2.3347***	-3.8466	-1.1575***	-3.8925	-2.3722***	-3.9187
<i>LEGAL</i>	0.4855	0.2998	0.5043	0.1573	0.2645	0.1644	0.2534	0.0799
<i>DISCTA*LEGAL</i>	-6.0469	-0.2828	12.0482	0.4142				
<i>DISCL*LEGAL</i>					24.9243	0.5191	76.4717	0.8891
Observations	481		478		481		478	
R-squared	0.3005		0.3348		0.3167		0.3540	
F-statistic	2.8576***		3.1627***		3.0041***		3.3549***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *LEGAL* is the strength of borrowers' legal rights developed by the Doing Business database. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.



**Table 12.** Loan loss provisions and loan growth for small bank sample

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	0.0537	0.4058	0.0105	0.0381				
<i>NDISCTA</i>	-0.3532***	-2.8634	-0.6955***	-2.6839				
<i>DISCL</i>					-0.1626	-0.5680	-0.2189	-0.3574
<i>NDISCL</i>					-2.3166***	-6.0646	-4.1564***	-5.0061
<i>EQTA</i>	-0.1999	-1.4749	-0.6045*	-1.9061	-0.1592	-1.1982	-0.4569	-1.4576
<i>DTA</i>	-0.0330	-0.3944	-0.0651	-0.3543	-0.0932	-1.1322	-0.1104	-0.6107
<i>SIZE</i>	0.0543***	3.0962	0.0811**	2.2364	0.0635***	3.6761	0.0949***	2.6373
<i>LGDPR</i>	-0.1528*	-1.7803	-0.1936	-1.0881	-0.2132**	-2.5305	-0.3021*	-1.7147
<i>SHRATE</i>	-1.1078***	-4.9251	-2.2342***	-4.8611	-1.0835***	-4.9379	-2.2036***	-4.8772
Observations	817		794		816		793	
R-squared	0.4818		0.4147		0.5069		0.4341	
F-statistic	4.2992***		3.4533***		4.6425***		3.6533***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 13.** Loan loss provisions and loan growth for small bank sample: Do private credit bureaus matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	0.1911	1.2811	0.2469	0.8601				
<i>NDISCTA</i>	-0.4462***	-3.3611	-0.8710***	-3.4622				
<i>DISCL</i>					0.2509	0.5589	0.8659	0.7837
<i>NDISCL</i>					-2.3364***	-4.7392	-4.1274***	-4.8387
<i>EQTA</i>	-0.1774	-1.2983	-0.5989	-1.6061	-0.1703	-0.8856	-0.4892	-1.3183
<i>DTA</i>	-0.0189	-0.2148	-0.0365	-0.1500	-0.0712	-0.6993	-0.0996	-0.4154
<i>SIZE</i>	0.0606***	3.4235	0.0920**	2.1408	0.0688***	3.6111	0.1098***	2.6252
<i>LGDPR</i>	-0.1363	-1.5463	-0.1672	-0.8863	-0.2000**	-2.2930	-0.2986*	-1.6629
<i>SHRATE</i>	-1.0856***	-4.8335	-2.1935***	-3.8738	-1.0751***	-4.7233	-2.1857***	-3.9874
<i>PRIVBUR</i>	0.0309	1.1740	0.0526	0.8475	0.0259	1.1602	0.0367	0.6054
<i>DISCTA*PRIVBUR</i>	-1.4731**	-2.0282	-2.7274*	-1.8608				
<i>DISCL*PRIVBUR</i>					-1.8905**	-2.3426	-4.9161**	-2.5713
Observations	817		794		816		793	
R-squared	0.4844		0.4163		0.5096		0.4389	
F-statistic	4.3051***		3.4489***		4.6512***		3.6819***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PRIVBUR* is the proportion of individuals and firms listed by a private credit bureau. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 14.** Loan loss provisions and loan growth for small bank sample: Do public credit registries matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	-0.2113	-0.7748	-0.0201	-0.0345				
<i>NDISCTA</i>	-0.4558***	-2.9749	-0.7069**	-2.1187				
<i>DISCL</i>					-0.4868*	-1.7101	-0.7394	-0.8408
<i>NDISCL</i>					-2.3535***	-10.1207	-4.2152***	-6.8236
<i>EQTA</i>	-0.1905	-1.3890	-0.6130*	-1.9035	-0.1630	-0.9884	-0.4728**	-2.0979
<i>DTA</i>	-0.0346	-0.4119	-0.0640	-0.3471	-0.0907	-0.7138	-0.1095	-0.3849
<i>SIZE</i>	0.0582***	3.0802	0.0792**	2.0259	0.0646***	3.2073	0.0945**	2.1791
<i>LGDPR</i>	-0.1527*	-1.7779	-0.1939	-1.0879	-0.2114**	-2.3798	-0.3103	-1.3569
<i>SHRATE</i>	-1.1046***	-4.9077	-2.2337***	-4.8511	-1.0823***	-3.3289	-2.1940***	-2.9573
<i>PUBREG</i>	-0.0235	-0.3013	0.0249	0.1539	-0.0025	-0.0274	0.0439	0.2198
<i>DISCTA*PUBREG</i>	1.5881**	1.1326	0.1512	0.0499				
<i>DISCL*PUBREG</i>					3.2664**	1.8659	6.0932**	1.4283
Observations	817		794		816		793	
R-squared	0.4813		0.4126		0.5073		0.4336	
F-statistic	4.2633***		3.4116***		4.6177***		3.6250***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PUBREG* is the proportion of individuals and firms listed by a public credit registry. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.

**Table 15.** Loan loss provisions and loan growth for small bank sample: Do borrowers' legal rights matter?

Explanatory variables	<i>DLOAN</i>		<i>LOANG</i>		<i>DLOAN</i>		<i>LOANG</i>	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>DISCTA</i>	0.2292	0.3070	-2.2657	-1.1187				
<i>NDISCTA</i>	-0.3540***	-2.7741	-0.6109***	-2.6528				
<i>DISCL</i>					-2.9525***	-3.0522	-8.2554***	-2.9595
<i>NDISCL</i>					-2.3918***	-4.6287	-4.3927***	-4.7290
<i>EQTA</i>	-0.1924	-0.9151	-0.6332*	-1.7061	-0.1120	-0.6141	-0.4933	-1.3875
<i>DTA</i>	-0.0373	-0.3773	-0.0526	-0.2213	-0.0834	-0.8668	-0.0892	-0.3987
<i>SIZE</i>	0.0565***	2.6917	0.0758*	1.7246	0.0596***	2.9677	0.0852**	1.9941
<i>LGDP</i>	-0.1742*	-1.7416	-0.1327	-0.6646	-0.1762*	-1.8119	-0.1837	-0.9499
<i>SHRATE</i>	-1.1234***	-4.5354	-2.1965***	-3.8244	-1.0807***	-4.6708	-2.1445***	-3.8691
<i>LEGAL</i>	0.5606	0.3960	-0.7147	-0.2402	-0.3695	-0.2701	-2.2142	-0.7542
<i>DISCTA*LEGAL</i>	-3.3136	-0.2399	43.1925	1.1136				
<i>DISCL*LEGAL</i>					49.1530***	3.0735	146.8840***	2.6871
Observations	817		794		816		793	
R-squared	0.4803		0.4147		0.5117		0.4423	
F-statistic	4.2502***		3.4319		4.6820***		3.7189***	

**Notes:** *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of equations (1a) and (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of equations (1a) and equations (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDP* is the logarithm of real gross domestic product. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *LEGAL* is the strength of borrowers' legal rights developed by the Doing Business database. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. \*\*\* indicates significance at the 1 percent level, while \*\* and \* indicate significance at the 5 percent and 10 percent levels, respectively.